

10. (a) Explain the term “classification” and “tabulation” and point out the importance in a statistical investigation.

6

- (b) Compute the median of the following data.

 $6\frac{1}{2}$

Size of Item	Fequency
0-5	20
5-10	24
10-15	32
15-20	28
20-25	20
25-30	16
30-35	34
35-40	10
40-45	8

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2020

STATISTICS*Full Marks : 100**Time : 3 hours**The figures in the margin indicate full marks for the questions**General Instructions :*

- (i) Write all the answers in the Answer Script.
- (ii) Attempt Part —A Objective Questions serially.
- (iii) Attempt all parts of a question together at one place.

(PART : A — OBJECTIVE)

(Marks : 50)

SECTION – I

(Marks : 20)

1. Choose and write the correct answer : $1 \times 10 = 10$

- a. The number of combinations of ‘ n ’ different things taken ‘ r ’ at a time in which two particular things never occur is

(i) ${}^{n-2}C_r$

(ii) ${}^{n-2}C_{r-2}$

(c) Prove that ${}^nP_r + r \cdot {}^nP_{r-1} = {}^{n+1}P_r$ where $0 \leq r \leq n$. 5

6. (a) Write down Newton's forward interpolation formula. Find the value of $f(1)$ from the following data $2\frac{1}{2} + 5 = 7\frac{1}{2}$

x	:	0	2	4	6
$f(x)$:	8	11	20	41

(b) Define Δ and E . State the properties of Δ and E . 5

GROUP — B

7. (a) State and prove the addition Law of Probability. $2 + 4 = 6$

(b) A couple has 2 children. Find the probability that both are boys if it is known that $2 + 2 = 4$

(i) One of the children is a boy

(ii) the elder child is a boy.

(c) If A and B are independent events such that $P(A) = 0.3$ and $P(B) = 0.4$. Find $P(\bar{A})$ and $P(\bar{B})$. $2\frac{1}{2}$

e. The value of $\Delta 2^x$, taking interval of difference to be unity is

(i) $3 \cdot 2^x$

(ii) 2^{x+1}

(iii) 2^x

(iv) none of the above.

f. If $P(E)$ is the probability of an event, then

(i) $P(E) < 0$

(ii) $0 \leq P(E) \leq 1$

(iii) $-1 \leq P(E) \leq 1$

(iv) $P(E) > 1$.

g. If A and B are two events associated with a random experiment such that $P(B) = 0.35$, $P(A \cup B) = 0.85$ and $P(A \cap B) = 0.15$ then $P(A)$ is

(i) 0.65

(ii) 0.40

(iii) 0.50

(iv) none of the above.

(5)

2. Fill in the blanks : $1 \times 5 = 5$

- (a) If ${}^nC_{16} = {}^nC_{14}$, then ${}^nC_{28}$ is _____.
- (b) If m and n are positive integers, we can define $\Delta^m[\Delta^n f(x)]$ as _____.
- (c) If A and B are two mutually exclusive events then $P(A \cup B) - P(A) - P(B) =$ _____.
- (d) The median of the values 11, 7, 6, 9, 12, 15, 19 is _____.
- (e) The relationship between variance and standard deviation of a variable x is _____.

3. Write whether the following statements are *True* or *False*. $1 \times 5 = 5$

- (a) If n and r are positive integers and $r \leq n$, then ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$
- (b) The expression $E^2 f^2(x)$ and $[Ef(x)]^2$ are identical.
- (c) If A and B are independent events, then \bar{A} and \bar{B} are also independent.
- (d) For comparing the health conditions of two towns, we have to calculate standardised death rate.

(6)

- (e) If A denotes the arithmetic mean and G denotes the geometric mean between two positive numbers then $A < G$.

SECTION — II

(Marks : 30)

4. Answer the following questions : $3 \times 10 = 30$

- (a) If ${}^nP_r = 840$, ${}^nC_r = 35$, find r .
- (b) Find the term independent of x in the expansion of $\left(3x - \frac{2}{x^2}\right)^{15}$
- (c) If $f(x) = (1-x)(1-2x)(1-3x)$, then find the value of $\Delta^3 f(x)$.
- (d) Evaluate $\frac{\Delta^2 x^3}{E^2 x^3}$.
- (e) Let A and B be events such that $2P(A) = P(B) = \frac{5}{13}$ and $P\left(\frac{A}{B}\right) = \frac{2}{5}$ Find $P(A \cup B)$.

(4)

h. For the set of observations, given that median = 8 and mode = 4, then mean is

- (i) 10
- (ii) 20
- (iii) 32
- (iv) none of the above.

i. Gross reproduction rate is defined as

- (i)
$$\frac{\text{Total fertility} \times \text{Female births}}{\text{Total births}}$$
- (ii)
$$\frac{\text{Total births}}{\text{Female Population}}$$
- (iii)
$$\frac{\text{Total fertility} \times \text{Total births}}{\text{Female Births}}$$
- (iv) none of the above.

j. Standardised death rates are particularly useful for

- (i) comparing death rates in male and female
- (ii) comparing death rates in two regions.
- (iii) both (i) and (ii)
- (iv) neither (i) and (ii).

(7)

(f) A can solve 90% of the problems given in a book and B can solve 70%. What is the probability that atleast one of them will solve a problem selected at random from the book.

(g) Calculate the variance of
3, 6, 8, 12, 8, 6, 15, 8, 9, 7.

(h) What are the various methods of collecting statistical data?

(i) Mention three uses of vital statistics.

(j) What are the characteristics for an ideal measure of central tendency?

(PART : B — DESCRIPTIVE)

(Marks : 50)

Answer **four** questions, taking atleast **one** from each Group.

GROUP — A

5. (a) Find the number of different words that can be formed from the letters of the word 'TRIANGLE' so that the vowels are together.

$4\frac{1}{2}$

(b) Determine whether the expansion of $\left(x^2 - \frac{2}{x}\right)^{18}$

will have a term containing x^{18} ?

3

(iii) ${}^nC_{r-2}$

(iv) $2! {}^{n-2}C_{r-2}$

b. The middle term(s) in the expansion of $(a+b)^{10}$ is the

(i) 5th term(ii) 6th term(iii) 5th term and 6th term(iv) 4th term and 5th term.

c. Newton's backward formula is used when the interpolating value lies

(i) at the beginning of the series.

(ii) in the middle of the series.

(iii) in the end of the series.

(iv) none of the above.

d. The relation between E and Δ is

(i) $E = 1 + \Delta$ (ii) $\Delta = 1 + E$ (iii) $\Delta^2 = 1 + E$

(iv) none of the above.

8. (a) A factory has 100 workers, 60 of them work in the morning section and 40 in the evening section. The mean wage of all the workers is Rs. 38. The mean wage of the workers in the morning section is Rs. 40. What is the mean wage of the workers in the evening section? 4

(b) For any event E , prove that 3

$$P(\bar{E}) = 1 - P(E).$$

(c) A and B throw a die alternately till one of them gets a 6 and wins the game. Find their respective probabilities of winning if A starts first. $5\frac{1}{2}$

GROUP — C

9. (a) Define crude death rate and point out its limitations. Explain clearly the standardized death rate including the method of computation. Why is a standardized death rate needed?

$$1 + 1\frac{1}{2} + 2 + 2 = 6\frac{1}{2}$$

(b) Which of the two localities A and B is healthier.

$$3 + 3 = 6$$

Age Group	Locality A		Locality B	
	Popula- tion	Deaths per 100	Popula- tion	Deaths per 100
0-10	600	30	400	40
10-20	1000	5	1500	4
20-60	3000	8	2400	10
60 and above	400	50	700	30